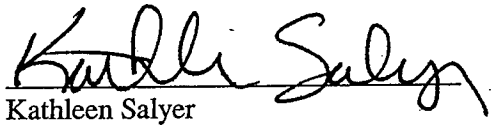
Remedial Action Report
for
Soil and Groundwater
Southern California Edison,
Visalia Pole Yard Superfund Site,
Visalia, California

This report presents a description of the work performed for the soil and groundwater remedial actions at the Southern California Edison, Visalia Pole Yard Superfund Site in Visalia, California. This report has been prepared in accordance with EPA's guidance, "Close Out Procedures for National Priority List Sites," OSWER Directive 9320.2-09A-PPB98-9632233, October 1999.

Approved by:

Signature 

Date 5/14/09

Name Kathleen Salyer

Title Assistant Director,
Superfund Division
California Site Cleanup Branch
U.S. EPA, Region 9

Remedial Action Report

Southern California Edison, Visalia Pole Yard Superfund Site, Visalia, California Soil and Groundwater Remedy EPA CERCLIS ID Number CAD 980816466

I. INTRODUCTION

This Remedial Action (RA) Report documents the Southern California Edison cleanup activities for soil and groundwater at the Visalia Pole Yard (VPY) Superfund Site ("Site"). The State of California, Department of Toxic Substances Control (DTSC) is the lead regulatory agency for this site. The VPY Superfund site is located at 432 North Ben Maddox Way in northeastern Visalia, Tulare County, California. Visalia is approximately midway between Fresno and Bakersfield in the Central Valley of California and is a growing metropolitan area with a population of approximately 110,000. Agriculture is the dominant industry in the region and walnuts, olives, and citrus are the primary crops.

From 1925 to 1980, the Southern California Edison Company operated a fabrication yard (Visalia Pole Yard (VPY)) to produce wooden poles for use in the distribution of electricity throughout the utility's service territory. Western red cedar trees were logged and transported to the yard, debarked, sized, shaped, and chemically preserved to resist attack from fungi and insects. The chemical preservation treatment process consisted of immersion of the wooden poles in heated tanks of preservative fluid. The treatment system consisted of two above-grade dip tanks, one in-ground full treatment tank, a fluid heating system, hot and cold fluid storage tanks, and underground product transfer lines. SCE primarily used creosote to treat its utility poles. However, in 1968, SCE began using pentachlorophenol (PCP), since PCP treated poles looked "cleaner" and were felt to be more suitable for use in an urban environment A solution of pentachlorophenol and diesel (petroleum hydrocarbons) was substituted as the preservative for the wood preservation process, which contained low levels of dioxin and furan - byproduct impurities of the PCP manufacturing process.

During the service life of the Visalia Pole Yard, significant volumes of chemical preservatives were released into subsurface soils and groundwater. Groundwater contamination was first discovered in an on-site well in 1966. Hydrogeologic investigations were conducted between 1966 and 1975 to determine the nature and extent of contamination.

The types of chemicals found at the VPY include creosote compounds, PCP, and its associated impurities including octachlorodibenzo-P-dioxin. The sources of chemical releases of creosote and PCP were primarily leakage from piping between the storage tanks and treatment tanks and cracks in the treatment tanks.

The Remedial Investigation ((RI) Geraghty & Miller, 1992a) found a distribution of the wood treating chemicals in both the vadose zone and saturated zone at the VPY. Additionally, at that time, the non-aqueous phase diesel hydrocarbon plume covered a horizontal area approximately 2.1 acres in size and extended vertically to approximately 125 feet below ground surface (bgs).

The geologic strata underlying the VPY are composed of alluvial-fan deposits from the Kaweah River and its distributaries. The three hydrostratigraphic units beneath the site include: a shallow aquifer (30 to 50 feet bgs; dewatered since the 1980s), a shallow aquitard (50 to 75 feet bgs), an intermediate aquifer (75 to

100 feet bgs), an intermediate aquitard (100 to 125 feet bgs), and a deep aquifer (125 to about 180 feet bgs). Both aquitards generally consist of silty sand and clay materials, whereas the aquifers are composed primarily of fine-grained and coarse-grained sands. When saturated, the shallow aquitard restricts vertical groundwater movement. Aquifer testing of the intermediate hydrostratigraphic unit indicated a transmissivity of approximately 50,000 gallons per day per foot (gpd/ft). Short-term pumping from the deeper aquifer affects hydrostatic water elevation levels in the intermediate aquifer.

Wood treating chemicals (WTCs) were present in the vadose zone and were found to be concentrated near points of release (immersion tanks and piping). Some horizontal-radial dispersion of these chemicals in the shallow vadose zones occurred by capillary action of fine grained soils and flat-lying stratigraphy. Transport of WTCs laterally from the source area occurred during times when the vadose zone was saturated. Historical water table levels were about 30 feet bgs and are currently measured at approximately 80 feet bgs. Depression of the regional water table levels initially occurred during the state-wide drought of the 1980's, and continues to decline from increased regional groundwater pumping for residential, agricultural, and industrial uses.

II. REMEDY

The VSY remedy was completed in several stages over a more than twenty-eight year period. These stages included several early remedial actions by the State of California before the site was added to the NPL in 1989. After 1989, in addition to the existing treatment systems, the site underwent a pilot study, which operated in two phases, and added an enhanced biological treatment system. The remedy stages are briefly described further below.

Early Remedial Actions

- In 1976, the State issued a Cleanup and Abatement Order, requiring Southern California Edison to abate discharge of treatment fluids into the soil, to contain contaminated soil and water on the property, to pump shallow groundwater under the site before and during construction of an underground slurry wall around the site, to pump and lower the confined aquifer to remove contamination, and to clean up contaminated shallow groundwater off site.

- In 1977, a slurry wall was built to slow contaminant migration in the shallow aquifer. The slurry wall extended to a depth of approximately 60 feet bgs and was keyed into the shallow aquitard to restrict further lateral, chemical migration into the shallow aquifer. Groundwater wells were installed to remove chemically affected groundwater for subsequent discharge into the local POTW sanitary sewer system.

- In 1981, all treating facilities were demolished and approximately 2,300 cubic yards of contaminated soil were removed and disposed of it into an off-site Class 1 disposal facility.

- In 1985, an onsite water treatment plant using filtration and adsorption was constructed. The plant was modified to include additional filtration and gravity separation in 1987, which optimized plant performance by minimizing hazardous waste generation. The treated effluent was then discharged to Mill Creek under a National Pollutant Discharge Elimination System (NPDES) permit.

- In 1987, Southern California Edison and the State signed an agreement requiring the utility to perform a study to determine the nature and extent of site contamination and to recommend alternatives for final cleanup action.

- In 1989, the VPY was added to the Federal Superfund National Priorities List (NPL) by the United States Environmental Protection Agency (USEPA).

- The 1992 Feasibility Study (FS) report (Geraghty & Miller, 1992b) recommended enhanced in-situ biodegradation (EISB) in addition to continuing the pump-and-treat system as the recommended remedial action alternative.

- In 1994, the State approved a Remedial Action Plan, and a Record of Decision was signed on June 10, 1994. The major components of the selected remedy include: in-situ bioremediation, pilot test of steam remediation, property access restrictions and deed restrictions.

Pilot Study

- In 1997, a pilot study approved by DTSC and concurred by EPA, the Visalia Steam Remediation Project (VSRP), was initiated which used a steam injection technique called Dynamic Underground Stripping (DUS) to mobilize COCs. The pilot study operated in two phases between May 1997 and June 2000. Phase 1 operations focused on the intermediate aquifer, with injection and extraction wells screened between 80 and 100 feet bgs. Phase 2 operations began in November 1998 and included steam injection and extraction below the intermediate aquitard, with injection wells screened between 125 and 145 feet bgs. Phase 2 operations continued until June 2000, when a precipitous drop in the rate of removal of WTCs was measured.

In-Situ Bioremediation

- Following cessation of the VSRP, the enhanced biological degradation system was installed and operated (SCE, 2001) to augment existing physical processes that were initiated by Dynamic Underground Stripping and to encourage natural biological processes to flourish.

III. CONSTRUCTION ACTIVITIES

As noted earlier, cleanup activities were first initiated in 1975, with the installation of extraction wells to remove contaminated groundwater and discharge to POTW. This action was followed by construction of the slurry wall in 1976-77, to prevent further downgradient migration of WTCs in groundwater. Additionally, an onsite water treatment plant (WTP) consisting of filtration and adsorption system was built in 1985 and was successful in removing the chemicals of concern (COC) from the treated groundwater. The WTP was modified with additional filtration and gravity separation in 1987, which optimized plant performance by minimizing hazardous waste generation. The WTP pumped, treated, and discharged an average of 0.36 million gallons per day between 1985 before the construction and operation of the Visalia Steam Remediation Project (VSRP) in March of 1997 when the volume of water treated increased to approximately 0.5 million gallons per day.

The VSRP system consisted of the following elements:

- A steam injection system including four 50,000 lb/hr steam boilers connected to eleven injection wells placed around the periphery of the WTC plume;
- A vacuum extraction system consisting of four vapor and liquid extraction wells, with follow-on liquid and vapor separation, liquid cooling, and vapor and liquid treatment; and

- An ERT and thermocouple-based thermal monitoring array completely surrounding the steam injection-vacuum extraction systems.

The VSRP operated in two phases, between May 1997 and June 2000. Phase 1 operations focused on the intermediate aquifer, with injection and extraction wells screened between 80 and 100 feet bgs. Phase 2 operations began in November 1998 and included steam injection and extraction below the intermediate aquitard, with injection wells screened between 125 and 145 feet bgs. Phase 2 operations continued until June 2000, when a precipitous drop in the rate of removal of WTCs was measured.

Following cessation of the VSRP, the enhanced biological degradation system was installed and operated (SCE, 2001) to augment existing physical processes that were initiated by Dynamic Underground Stripping (DUS) and to encourage natural biological processes to flourish. This system was in operation from June 2000 until March 2004. It included vadose zone bioventing and saturated zone biosparging, coupled with continued groundwater pump-and-treat operation. Construction completion of the enhanced biological degradation system was documented in the 2001 Preliminary Close Out Report (PCOR).

A post-remediation soil investigation of the surface soils was conducted at this site in November 2004. Tetrachlorodibenzo-p-dioxin (TCDD) was detected slightly above the cleanup standards at four locations. As a result of the 2005 Five-Year Review, contaminated surface soil (soil between zero and ten feet below grade) was removed in July 2006 and verified with confirmatory sampling to be below the cleanup standards prescribed in the ROD.

A "Covenant to Restrict Use of Property, Environmental Restriction", between Southern California Edison and the Department of Toxic Substances Control (DTSC), was recorded in Tulare County, California on May 23, 2007. This Covenant satisfies the ROD/RAP requirement for property access restrictions and a deed restriction. The Covenant outlines use restrictions (as well as Site operation and maintenance (O&M) activities). As remedial action objectives are based on industrial cleanup standards, prohibited Site Uses include: residences, human hospitals, schools, and day care centers for children. Prohibited Activities include: soil disturbance greater than ten feet below grade, and the installation of water wells for any purpose. The Covenant requires the Site owner to conduct an annual inspection of the property and prepare an Annual Inspection Report, describing how all of the site restrictions are being complied with. The Annual Report must certify that the property is being used in a manner consistent with the Covenant, and must be submitted to DTSC by June 15th of each year.

IV. CHRONOLOGY OF EVENTS

Date	Event
June 14, 1994	ROD signed.
March 4, 1996	Dynamic Underground Stripping Project Plan and Preliminary Engineering submitted.
May 1997	Initiation of VSRP operations.
December 15, 1999	Remedial Design for EISB submitted.
April 28, 2000	Remedial Design approved by DTSC.
September 17, 2001	Remedial Action Plan Construction Completion Report submitted.
September 25, 2001	Preliminary Close Out Report issued by USEPA Region IX.
February 25, 2002	Remedial Action Plan Construction Completion Report approved by DTSC.
October 27, 2005	First Five–Year Review Report issued by EPA
November 8, 2005	Soil Investigation Report of Surface Soils in Pole-Treating Area submitted to DTSC.
January 2007	"Hot Spot" Removal in Pole-Treating Area reported to DTSC.
May 23, 2007	Land Use Covenant recorded with Tulare County.
May 2008	Remedial Action Completion Report submitted to DTSC.
December 4, 2008	Approval of the Remedial Action Completion Report issued by DTSC.

V. PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

Analytical results from the RI indicated the following maximum concentrations for the three chemicals of concern in soil and groundwater:

SOIL

Pentachlorophenol	4,100 mg/kg
Benzo(a)pyrene	42 mg/kg
TCDDeqv. (as OCDD)	2.3 mg/kg

GROUNDWATER

Pentachlorophenol	610 µg/L
Benzo(a)pyrene	5 µg/L
TCDDeqv (as OCDD)	11 µg/L

Soil and groundwater samples were collected during the RI, the site remediation process, and the cleanup verification period. Soil samples were analyzed for pentachlorophenol and benzo(a)pyrene by EPA Method 8270. Dioxins and furans were analyzed by EPA Method 8280. Groundwater samples were analyzed for pentachlorophenol and benzo(a)pyrene by EPA Method 8270 during the investigation phase, and by EPA Method 525.2 during the cleanup verification period. EPA Method 8280 was used for dioxin and furan analysis throughout the investigation, cleanup, and attainment periods.

Table 1, below, shows the results of remedial action confirmation sampling as compared to the remedial action objectives and cleanup standards outlined in the RAP and ROD which are based on industrial cleanup standards.

TABLE 1 - PERFORMANCE RESULTS COMPARED WITH REMEDIATION OBJECTIVES / CLEANUP GOALS

Remediation Objectives / Cleanup Goals	Performance Results
Cleanup goals in surface soils (0-10 feet bgs): Pentachlorophenol 17 mg/kg Benzo(a)pyrene 390 µg/kg TCDDeqv* 1 µg/kg	A post-remediation soil investigation of the surface soils was conducted at this site in November 2004. Tetrachlorodibenzo-p-dioxin (TCDD) was detected slightly above the cleanup standards (1ug/kg) at four locations. This was documented in the 2005 five year review. The contaminated surface soil from these four location (soil between zero and ten feet below grade) was removed in July 2006 and verified with confirmatory sampling to be below the cleanup standards prescribed in the ROD.
Cleanup goals for groundwater Pentachlorophenol 1 µg/L Benzo(a)pyrene 0.2 µg/L TCDDeqv 30 pg/L	Groundwater monitoring data collected over a three-year period between 2004 and 2007 indicated all cleanup standards were attained.

* Tetrachlorodibenzo-p-dioxin toxicity equivalence

Quality Assurance and Quality Control

The QA/QC program used throughout the RI, operation of the remediation systems, and cleanup standard attainment period was outlined in the Quality Assurance Project Plan (QAPP) and RI Work Plan approved by DTSC and EPA. The program enabled EPA to determine that all analytical results reported were accurate and adequate to ensure satisfactory execution of the remedial action, in a manner consistent with the requirements of the ROD.

Duplicate soil and groundwater samples were collected in accordance with the QAPP. Matrix spike, duplicate, and blank samples were analyzed by the laboratory, and the resulting data provided to DTSC and EPA. The QA/QC program was also used for the on-going quarterly groundwater monitoring program and cleanup standard attainment demonstration period.

VI. FINAL INSPECTION AND CERTIFICATION

Inspections

Regular inspections were made by both DTSC and EPA personnel during the RI, VSRP, EISB operation and maintenance period, and during site demolition.

Certification of Completion

SCE submitted the Remedial Action Completion Report outlining completion of the remedial action and attainment of the cleanup standards in accordance with the 1994 RAP/ROD, in May 2008. SCE presented the case history and demonstration of the attainment of the cleanup standards in a meeting with DTSC and

EPA project representatives on September 19, 2008. DTSC approved the Remedial Action Completion Report in December 2008.

VII. POST-CLOSURE OPERATION AND MAINTENANCE ACTIVITIES

The "Covenant to Restrict Use of Property, Environmental Restriction" also outlines Site operation and maintenance (O&M) activities. The Covenant requires the Site owner to conduct an annual inspection of the property and prepare an Annual Inspection Report, describing how all of the site restrictions are being complied with. The Annual Report must certify that the property is being used in a manner consistent with the Covenant, and must be submitted to DTSC by June 15th of each year. These activities constitute the post-closure operation and maintenance activities.

VIII. SUMMARY OF PROJECT COSTS

Table 2 provides a summary of labor and capital costs differential of the actual project costs with the estimated costs included in the ROD. The cost estimates were based on the selected (FS derived) remedial alternative of enhanced in-situ bioremediation and steam remediation. The estimates presented below are a summary of soil and groundwater treatment costs which were recorded in the 1994 ROD.

TABLE 2 - COST SUMMARY

	ROD Estimate (NPV 1994, 30 yrs)	RA Cost (Actual $$ 1996-2006)
Capital	$6,567,000	$7,100,000
O&M	$2,254,000 (annual)	$22,770,000
Total	**$45,200,000**	**$29,870,000**

TABLE 3 - SITE CHARACTERISTICS AND CONDITIONS

Parameter	Site Conditions	Measurement Procedure / Comment*
Air temperature (°F)	71 (average for 1997) 72 (average for 1998)	NA
Humidity (%)	76 (average for 1997)	NA
Barometric pressure (inches of mercury)	30.07 (average for 1997)	NA
Average rainfall (inches)	50.39 (1997) 43.53 (1998)	NA
Soil classification	Mixture of clayey silt to sandy gravel	Uniform Soil Classification System

The implemented Remedial Action at Visalia cost approximately $29.87 million from 1996 through 2006. Approximately $7.1 Million were capital cost for the project hardware including boilers (rental), piping,

valving, instrumentation, heat exchangers, cooling towers, pumps, vacuum system, wells, water treatment plant up-grades, carbon adsorbers, and thermal imagery. The remaining $22.77 million was expended for labor and O&M cost of fuel, electricity, hazardous waste disposal, adsorption media, filter media, and laboratory analyses, to operate the steam injection system, vapor and liquids recovery system, thermal imagery, and water treatment plant operation.

IX. OBSERVATIONS AND LESSONS LEARNED

The project cost approximately 34% less than the ROD estimate, largely due to implementation of the steam remediation technology, which reduced the time required to achieve the cleanup goals. The cleanup goals were reached in approximately 7 instead of 30 years. Based on the amount of WTCs removed during steam remediation, it is extremely unlikely that the cleanup goals would have been achieved in 30 years.

X. CONTACT INFORMATION

Primary Contacts:

Craig Eaker, Project Manager (626-302-8531)

Randy Weidner, Project Manager (626-302-4033)

Southern California Edison Company

2244 Walnut Grove Avenue

Rosemead, CA 91770

- *Calscience Environmental Laboratories, Inc.*

  7440 Lincoln Way, Garden Grove, CA 92841

  714-895-5494

- *STL Sacramento*

  880 Riverside Parkway

  West Sacramento, CA 95605

  916-373-5600

The Project Managers for SCE:

Craig Eaker (626-302-8531)
Randy Weidner (626-302-4033)

Southern California Edison Company

2244 Walnut Grove Avenue

Rosemead, CA 91770

The Remedial Project Manager for the EPA:

Charnjit Bhullar,
U.S. EPA Region IX

75 Hawthorne Street, SFD 7-3

San Francisco, CA 94105

415-972-3960